

REMARKS

Claims 1-31 are currently pending. Claims 1, 12, 14, 20, 23, 24, 28, 29 and 31 have been amended. The allowance of claims 7-11 and 16-19 and the indication of allowable subject matter in claims 12-15, 22, 23 and 28 are acknowledged with appreciation.

At the outset, it is noted that the Office Action Summary acknowledges receipt of the priority document for the present application, but suggests that the present application is a National Stage application based upon a PCT application. The Office's characterization of the present application in this regard appears to be an administrative oversight given that the present application was not filed as a National Stage application based upon a PCT application. If the Office's records differ from Applicants' records in this regard, the Office is respectfully requested to notify Applicants of the same.

In addition, a typographical error has been observed in the PTO-1449 form submitted with the Information Disclosure Statement (IDS) dated January 28, 2002. In particular, the document "JP 2000-199813" is listed correctly on the IDS, but is incorrectly listed as "JP 2000-1998313" on the PTO-1449 form (i.e., the extra "3" should not be present). Applicants would appreciate the Office's assistance in ensuring that JP 2000-199813 is printed correctly on the face of a patent issuing from the present application.

The Office Action includes an objection to claims 12-15, 23, 28 and 31. With regard to claims 12-15, the Office alleges the range of values of the parameter "j" needs to be defined. Applicants respectfully traverse the objection, given that claims 12 and 14

already recite that “j” is the number of kinds of layers in one period of the dielectric multilayer film. It is respectfully submitted that a person of ordinary skill in the art would understand this definition, and its applicability to any given structure. Withdrawal of the objection against claims 12-15 is respectfully requested.

With regard to claims 23, 28 and 31, the Office appears to object to the recitation “j is an integer greater than one”, under the belief that these claims require at least three kinds of layers. However, these claims are also intended to cover a structure having two kinds of layers, such as illustrated in Figures 1-3, for example. It appears that the notation $(1/n_1 + 1/n_2 + \dots + 1/n_j)$ is being interpreted to mean at least three kinds of layers. To avoid any confusion, the notation has been revised in claims 23, 28 and 31 to clarify the fact that two kinds of layers are encompassed within the scope of these claims. Withdrawal of the objection is respectfully requested. In addition, claims 12 and 14 have been amended in a similar manner for consistency.

The Office Action includes a rejection of claim 29 under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite. Claim 29 has been amended to depend from claim 28. Withdrawal of the rejection is respectfully requested.

The Office Action includes a rejection of claims 1-6, 20, 21 and 24-27 under 35 U.S.C. §102(b) as allegedly being anticipated by the Nelson et al. patent (U.S. Patent No. 5,119,231). This rejection is respectfully traversed.

Independent claim 1 has been amended and recites a diffractive optical element comprising a substrate on which a diffraction grating is formed. The diffraction grating has

a level difference substantially perpendicular to a first surface of the substrate. The diffractive optical element also comprises a dielectric multilayer film *that conforms to* the diffraction grating, wherein the layers included in said dielectric multilayer film are arranged such that only the same kind of layers are continuous across the level difference of the diffraction grating. By reciting that the dielectric multilayer film conforms to the diffraction grating, the claim indicates that the topology of the film conforms to that of the grating.

In contrast, Figure 2 of the Nelson et al. patent does not disclose a diffractive optical element comprising a dielectric multilayer film *that conforms to* a diffraction grating as recited in claim 1. In particular, the interference stack 22 illustrated in Figure 2 of the Nelson et al. patent, which the Office alleges corresponds to the claimed dielectric multilayer film, does not conform to the diffraction grating 12. Rather, the interference stack 22 is a planar structure with no height variations that conform to the height variations of the diffraction grating 12. Accordingly, claim 1 is not anticipated by the Nelson et al. patent for at least this reason. Moreover, since the interference stack 22 has a planar topology, the device illustrated in Figure 2 of the Nelson et al. patent is not faced with the problem addressed by the present invention. Withdrawal of the rejection against claim 1 and allowance of the same are respectfully requested for at least these reasons. Claims 2-6 depend from claim 1 and are therefore allowable at least by virtue of dependency.

Independent claims 20 and 24 have been amended in a manner similar to that of claim 1, and Applicants respectfully submit that claims 20 and 24 are distinguishable from

the Nelson et al. patent at least for reasons set forth with regard to claim 1. Withdrawal of the rejections against claims 20 and 24 and allowance of the same are respectfully requested. Claim 21 depends from claim 20, and claims 25-27 and 29 depend from claim 24. Accordingly, claims 21, 25-27 and 29 are allowable at least by virtue of dependency.

The Office Action includes a rejection of claim 30 under 35 U.S.C. §102(b) as allegedly being anticipated by the structure disclosed in Figure 4 of the present application. This rejection is respectfully traversed.

Claim 30 recites a diffractive optical element, comprising a substrate having a diffraction grating formed by a series of depressions in a surface of the substrate, each of the depressions having a predetermined depth. The diffractive optical element also comprises a dielectric film on the surface of the substrate, comprising a plurality of layers of different kinds of materials arranged in a periodic manner. The layers have a thickness such that the predetermined depth is an integral multiple of one period of the layers.

In contrast, in the structure illustrated in Figure 4 of the present application, the predetermined depth (G) of the depressions is equal to the thickness of layer 53b plus *twice* the thickness of layer 53a, whereas one period of the layer structure is equal to the thickness of layer 53b plus the thickness of layer 53a. Accordingly, the predetermined depth (G) illustrated in Figure 4 is not an integral multiple of one period of the layers. Withdrawal of the rejection and allowance of claim 30 is respectfully requested for at least this reason.

The Office Action also includes a rejection of claim 31 under 35 U.S.C. §103(a) as allegedly being unpatentable over Figure 4 of the present application. This rejection is respectfully traversed.

Applicants respectfully submit that claim 31 is allowable at least by virtue of dependency from claim 30, and withdrawal of the rejection and allowance of claim 30 are respectfully requested for at least this reason. In addition, should the Office maintain this rejection, Applicants request that the Office cite a prior art reference supporting the assertion of well-known prior art so that the true content of the prior art can be assessed within the context of the field of the presently claimed invention.

The Office Action also includes an objection to claims 22, 23 and 28 as being dependent upon a rejected base claim, but otherwise allowable. Claims 22 and 23 depend from claim 20, and claim 28 depends from claim 24. Claims 20 and 24 are believed to be allowable at least for reasons set forth above. Accordingly, claims 22, 23 and 28 are believed to allowable in their present dependent form, and allowance of the same is respectfully requested.

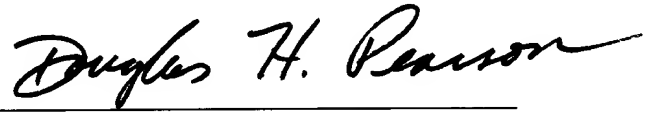
In light of the foregoing, withdrawal of the objections and rejections of record is respectfully requested so that the present application may pass to issuance. Should there be any questions in connection with this application, the Office is invited to contact the undersigned at the number below.

Respectfully submitted,

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ATTACHMENT TO AMENDMENT

Marked-up Claims 1, 12, 14, 20, 23, 24, 28, 29 and 31

1. (Amended) A diffractive optical element comprising:

a substrate on which a diffraction grating is formed, said diffraction grating having a level difference substantially perpendicular to a first surface of the substrate; and

a dielectric multilayer film [provided on] that conforms to the diffraction grating, wherein the layers included in said dielectric multilayer film are arranged such that only the same kind of layers are continuous across the level difference of the diffraction grating.

12. (Amended) The diffractive optical element as claimed in claim 7, wherein said dielectric multilayer film has a number, j , of kinds of layers in one period, where n_0 is a refractive index of the substrate, n_1 , $[n_2] \dots n_j$ are refractive indices of the different kinds of layers of the dielectric multilayer film, and m is an integer not less than 1, and the following equation is satisfied:

$$2/n_0 = m (1/n_1 + [1/n_2 +] \dots + 1/n_j).$$

14. (Amended) The diffractive optical element as claimed in claim 7, wherein said dielectric multilayer film has a number, j , of kinds of layers in one period, where n_1 , $[n_2] \dots n_j$ are refractive indices of the different kinds of layers of the dielectric multilayer film, and m is an integer not less than 1, and the following equation is satisfied:

$$2 = m (1/n_1 + [1/n_2 +] \dots + 1/n_j).$$

ATTACHMENT TO AMENDMENT

Marked-up Claims 1, 12, 14, 20, 23, 24, 28, 29 and 31

20. (Amended) A method of manufacturing a diffractive optical element, comprising:

a first step of forming on a surface of a substrate a diffraction grating having a level difference substantially perpendicular to a surface of the substrate; and

a second step of forming a dielectric multilayer film [on] that conforms to the diffraction grating on the surface of the substrate so that only the same kind of dielectric layers included in the dielectric multilayer film are continuous across the level difference of the diffraction grating.

23. (Amended) The method of claim 20, wherein said dielectric multilayer film comprises j kinds of layers, where j is an integer greater than one, and further including the step of selecting materials for each of said layers which satisfy the following condition:

$$2/n_0 = m (1/n_1 + [1/n_2 +] \dots + 1/n_j)$$

where n_0 is the refractive index of the substrate,

n_1 is the refractive index of one kind of layer,

n_2 is the refractive index of another kind of layer,

n_j is the refractive index of the j-th kind of layer,]

n_i is the refractive index of a layer i of said film, $i=1, \dots, j$, and

m is an integer greater than zero.

ATTACHMENT TO AMENDMENT

Marked-up Claims 1, 12, 14, 20, 23, 24, 28, 29 and 31

24. (Amended) A diffractive optical element, comprising:

a substrate having a diffraction grating formed by periodic depressions and projections on a surface thereof; and

a dielectric film [on] that conforms to said diffraction grating, said film comprising multiple layers of different kinds of dielectric material wherein at least some of said individual layers are continuous across plural successive depressions and projections of said diffraction grating.

28. (Amended) The diffractive optical element of claim 24, wherein said dielectric film comprises j different kinds of layers, where j is an integer greater than one, and the respective materials of said different kinds of layers satisfy the following condition:

$$2/n_0 = m (1/n_1 + [1/n_2 +] \dots + 1/n_j)$$

where n_0 is the refractive index of the substrate,

[n_1 is the refractive index of one kind of layer,

n_2 is the refractive index of another kind of layer,

n_j is the refractive index of the j-th kind of layer,]

n_i is the refractive index of a layer i of said film, $i=1, \dots, j$, and

m is an integer greater than zero.

29. (Amended) The diffractive optical element of claim [25] 28, where $j = 2$.

ATTACHMENT TO AMENDMENT

Marked-up Claims 1, 12, 14, 20, 23, 24, 28, 29 and 31

31. (Amended) The diffractive optical element of claim 30, wherein said dielectric film comprises j different kinds of layers, where j is an integer greater than one, and the respective materials of said different kinds of layers satisfy the following condition:

$$2/n_0 = m (1/n_1 + [1/n_2 + \dots + 1/n_j])$$

where n_0 is the refractive index of the substrate,

[n_1 is the refractive index of one kind of layer,

n_2 is the refractive index of another kind of layer,

n_j is the refractive index of the j-th kind of layer,]

n_i is the refractive index of a layer i of said film, $i=1, \dots, j$, and

m is an integer greater than zero.